Progress Report
Microorganism Study
J.P.L. Contract No. 950983

Ammonifying, Nitrifying, and Sulfur Oxidizing Capacity of Chile Desert Soils

W. B. Bollen, Microbiologist
Fred Au, Assistant in Microbiology
Oregon State University
Corvallis, Oregon
May 31, 1967

Activities of specific physiological groups of bacteria in the soil are an indication of their ability to release plant nutrients and thus convert potential fertility to active fertility. Determination of these activities in different soils by appropriate methods provides a basis for comparison and an indication of the presence and efficiency of the microbes involved.

1. Ammonification carried on by a wide variety of soil microbes including molds, streptomyces, and bacteria, especially representatives of Bacillus and Pseudomonas, is an hydrolytic conversion of proteins and other complex organic nitrogenous compounds to amino acids, followed by catabolic oxidation-reduction of the amino acids to water, carbon dioxide, and ammonium, with release of energy. The production of ammonium is most characteristic of the process and this feature is used for detecting and comparing the activity in different soils.

The method for determining ammonifying power or capacity consists of adding peptone or other proteinaceous material to a sample of soil, incubating, and assaying for ammonium after three to five days. To duplicate 50 g portions, oven-dry basis, of -10 mesh soil, peptone, equivelent to 1000 ppm nitrogen was added. After mixing well with the soil the mixture was transferred in four portions to a 250 ml widemouth Erlenmeyer flask, sufficient distilled water being added with each portion to bring the total moisture content to 50% of the water-holding capacity. The water was allowed to diffuse without further mixing. The flasks were covered tightly with 1,5 ml polyethylene film, which permitted gaseous exchange but prevented moisture loss. At the end of five days incubation at 28°C, 10 g, oven-dry basis, were transferred to a Kjeldahl flask and distilled with K_2HPO_4-KH_2PO_4 buffer at pH 7.4 into 30 ml saturated bonic acid solution (5). The absorbed ammonium was titrated with N/14 H_2SO_4, using methyl red bromcresol green indicator. Control soils, from which peptone was omitted, were treated in like manner. Nitrite and nitrate nitrogen were determined as outlined under Nitrifications in the following section and any increases over controls added to the ammonium produced, inasmuch as these increases represent oxidized ammonium. From these data the ammonification percentage was calculated, as in Table 2. One-to-five soil: water suspensions were used for pH determinations with a glass electrode.

microbial activity in releasing plant nutrients